THE ARCHITECT IN RELATION TO FIRE PREVENTION.

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LATE SUPERINTENDING ARCHITECT TO THE LONDON COUNTY COUNCIL.

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THE question of fire-resisting construction in this country has been treated before the Institute on several occasions. It has been handled with skill and knowledge by the more experienced and thoughtful among our own members, and we have been cordially assisted by visitors specially acquainted with the subject. It comes before us now after the lapse of several years, during which questions formerly in doubt have been settled and new ones have arisen; during which new materials, processes, and contrivances have been proposed; during which, also, the importance of the subject has become more evident through the increase of risk.

Buildings are now higher; those with lifts are several stories higher; warehouses are more closely packed with goods; windows and skylights are larger; arrangements for heating and lighting are producing greater warmth and dryness in all combustible materials, and more people work or sleep in the same area.

Are we of this generation keeping pace in this matter with the progress of events? Have we during the intervening years been doing all that might have been done to falsify the prophecies of evil that were addressed to the generation now passing away? These are wholesome necessary questions to put in this room where the voices of Hayter Lewis, George Godwin, and Charles Fowler among our own members, and Captain Shaw among our visitors, have registered their experiences and their warnings. Braidwood, the predecessor of Captain Shaw as the chief officer of the Metropolitan Fire Brigade, seriously apprehended conflagrations that would cast into the shade the worst of those he had known; he died in one of the largest of these some forty years ago.

I suppose we need not doubt that if London in 1666 had possessed anything like its existing organisation, the Great Fire would probably have been stopped in the vicinity of Pudding Lane. I unhesitatingly suggest that it was the possession of this Brigade rather than public regulations or structural skill that kept the recent fire in the Cripplegate area from rivalling that of 1666. Statistics that run into two figures are as odious to me as to you, but single instances are precious.

The Cripplegate area consisted chiefly of old houses, which through the extension of the City's trade had been turned into factories and warehouses stored with inflammable goods. The law did not require, nor did the fire offices demand nor human wit suggest, any precautions proper to this change of occupation. Indeed, the premises had been so treated as to make them materially less fire-resisting as warehouses than they had been as dwellings.

There was not in the whole area a single fire-resisting floor or roof or flat, not one staircase was enclosed with walls; the one staircase that was meant to be fire-resisting was of stone, and must now be eking out the pavement that is composed of good intentions. The party walls and ceilings were covered with matchboard lining, the party-walls everywhere had been surreptitiously pierced with doorway openings, so that the fire could pass readily from house to house. But this offence might almost be called venial when the streets and back areas were so narrow, and the skylights and lighting areas were so contrived, that fire passed unchecked as light passed through the openings in the outer walls. In all these circumstances I disdain to talk about the danger of the unprotected lifts. The whole area was pretty much as a household fire is laid ready for lighting. Several of these houses had been reconstructed in recent years after having burned out; some had risen again after a second fire. Some had been rebuilt voluntarily and handsomely, as one might see by the heaps of new brickwork, unprotected ironwork, and handsome unresisting stonework, that helped to choke the thoroughfares. All this or nearly all had been done under the eyes of the fire offices, and according to law. We may thus see how inefficient the law is in relation to the safety of property and human life.

I suggest, therefore, that we do not rely too much on Building Acts. Such legislation is made with a very limited foresight of future possibilities, and carried through Parliament against all kinds of opposition. At the best they only serve to bring up unskilled and unwilling builders to a very moderate standard. They must not be used to bring everybody down to a standard lower than prudence would dictate. Our building regulations are much less exacting than those in other large cities. I have been shown at the town halls and on the buildings in such cities the ceremonies that have to be gone through and the control exercised there, and I should not like to suggest such procedure here. It may be that our own people are less patient of control, and, if so, the responsibility of the architect is all the greater.

In this matter he will get no help from public opinion nor from private persons. One never meets with anyone who will seriously contemplate the chance of fire in any private house or public building in which he or his may be present. I asked one of the most eminent lawyers of our time who happened to be interested in an entertainment, "If your Lordship and your friends were here, and a fire broke out at that spot, how would you all get away?" He replied, "Well, in the first place no fire will break out. If it should, we would form a semicircle and watch it; one could seldom have such an opportunity of seeing a fine sight, with the engines galloping up and playing on the flames." That expressed the view which the public will always take. No fire did happen, and it was a thousand to one against it, so the bet which he practically made was fairly safe. Life would be too dismal if we were always contemplating possibilities against which the odds are a thousand to one. But when a catastrophe has occurred the public feels it must make atonement for its neglect, and looks out for a scapegoat—the scapegoat is the architect.

It is the architect who may reasonably be supposed to know most about the danger of fire and the means of fire-prevention. It is to him and not to his client that the public will look in cases of accident through neglect of precautions. It is to him indeed that the client himself will look if there is loss by fire, although he may have shut his eyes to risks and begrudged the cost of the structure as it stood. The architect must face the whole responsibility. The profession, moreover, has the duty, which this Institute acknowledges, of endeavouring to raise the standard of building, of discouraging bad customs, and of helping to amend the law in a matter over which its members must have exceptional means of control.

Let us bear in mind that in spite of anything we may be doing serious fires seem to be

occurring with their ordinary frequency. During the last month no fewer than four provincial theatres were burned—luckily after the audiences had gone. A fortnight since one of our London churches was set on fire in the usual way—by an overheated flue. A week ago five children lost their lives in a room behind a ground-floor shop. Not very long ago a larger number of persons perished in a ground-floor room, and this shows the suddenness of such visitations. We have all seen in the "Biograph" an American fire-extinguisher tearing towards a fire. This machine is said to be a good deal smarter than ours, but eleven days ago five hundred girls jumped out of the windows of a factory in Pennsylvania rather than wait. These and such-like incidents show superabundantly the necessity of providing means for instantaneous escape, and they serve to link the question of panic with the question of fire.

The ways in which the architect may assist in the prevention of fire are such as these:—

1. By studying the causes and the results of fire in buildings, and the phenomenon of panic.

2. By using such materials and construction as will render a building fire-resisting and will ensure adequate means of escape.

3. By endeavouring to convince his clients and the public of the urgency of the precautionary measures that he knows to be necessary.

4. May I add by endeavouring to work cordially with the municipal authorities in matters about which they must know something, and for which they have a responsibility of their own?

When, at the Conference of Architects held here in 1878, the question of fire-resisting materials was dealt with by Mr. Arthur Cates, now a past Vice-President, in a Paper full of practical usefulness, chief attention was given to concrete. Since then we have become more familiar with its properties, and know that, for entire reliability, we must look to such materials as have already been subjected to extreme heat. The best of those easily available is coke-breeze mixed with cement. This material is also light, a matter of great importance, and it is reasonably cheap. For our fire-resisting floors we are indebted to the builders in Paris, who, owing to a strike of carpenters in 1840, got rolled-iron joists and filled in between them with coarse plaster of Paris, in various combinations. We have followed very leisurely in their wake.

A floor of iron or steel joists and coke-breeze concrete withstands fire and the subsequent application of water. The boards should be nailed down close upon this, as upon every floor, and the ceiling applied directly under it, with no open space above or below. In this way all the floors of the numerous blocks of artisans' dwellings put up by the London County Council have been done, and they have cost less than good wooden floors pugged to resist fire. There are half-a-dozen well-known systems of fire-resisting floor suitable for larger buildings. If these cannot be used the ordinary wooden floor should invariably be pugged. From work that I have seen, I am inclined to use joists of double thickness, with spaces of double width and fire-resisting boarding, pugging, and ceiling. In all floors, partitions, and linings of walls, great care should be taken to prevent the escape of gas into any hollow spaces; indeed, continuous hollows, along which the inflammable air from burning matter may travel, are a principal source of danger. The lath-and-plaster partition should be abandoned, and thin brick, coke-breeze, or other fire-resisting materials substituted. No space should be left for air to pass by cornice, floor, and skirting, from one story to another. There is now some choice of thin fire-resisting slabs for lining walls, so that boarding is unnecessary; but there should be no upward current of air behind them. Captain Shaw told us of cases where the lower stories had been burned, and inflammable vapour passed upwards behind the wall linings, so that the upper stories were burned also, while intermediate stories escaped.

Plastering as a fire-resisting covering for walls, partitions, iron construction, and timber both in old and new buildings, is now assuming great importance. Asbestos and the more recently introduced asbestic are exceedingly useful for all these purposes, and in different forms are amongst the materials available for thin partitions, skirtings, door and window architraves, and indeed for almost any purpose for which wood is now used in joinery. At the present time it may be said that there is no absolute need for wooden joinery or carpentry, and that the cost of fire-resisting substitutes is becoming reasonably cheap. I believe the party-wall, when well built and continued through the roof as the London Building Act requires, is quite satisfactory. In external walls all blocks and lintels should be abandoned for fire-resisting materials, which can readily be cast on the works. The serious point about these walls is the increasing size of the openings, and this is unfortunately encouraged by the Act of 1894. In narrow streets, particularly in warehouses, such openings with wooden window frames set near the outer face of the wall, invite disaster. With such openings fire-resisting shutters are more than ever necessary. It may be difficult to apply these to old windows, but it will probably be found that asbestos applied to light iron framework, as in some fire-resisting curtains in theatres, is all that is necessary to arrest fire until a fire-engine can be brought to bear. Slag wool, however useful it may be, is not an efficient substitute for asbestos. There is a class of people who, if they cannot do just what they want, will sit still and do nothing. To encourage such I may mention an interesting thing. In a very extensive building, where the upper floor of many rooms was burnt out, all the windows and all the glazed internal doors were fitted with stout green holland roller blinds. All the burnt roofs had fallen on to the floor, and where the glazing was unprotected it was broken by the heat. But where the holland blinds happened to be drawn down the glazing generally escaped. This seems to suggest that even a stout roller blind of fire-resisting material might be enough to keep back for a time the radiated heat from a fire across a narrow street. All shutters or blinds must extend well beyond the openings.

As to window-glass, experiments at the British Fire Prevention Committee's premises indicate that such glazing as that called "Luxfer," and that which embeds a wire mesh, offer very great resistance to extreme heat. I think the work of that Committee may be expected to throw much light on the real merits of materials and processes put forward as being fire-resisting, while the experiments made by patentees are quite unreliable. In all experiments the use of petroleum, which gives light rather than heat, is deceptive. Much more investigation is required into the merits of solutions intended to render wood and canvas non-combustible, and into the permanency of their effect. The bearing of this on stage scenery, every portion of which should be rendered non-combustible, is evident. As to timber, though the application of a fire-protecting solution may be of some utility, nothing short of forcing the solution into the substance seems likely to be satisfactory. On the other hand, we know that when wooden beams and joists are massive, they resist fire much better than unprotected iron.

Gas fittings, if we are to continue to use gas, need the most careful supervision when new, and inspection when old. Compo pipe is often used, the end of a pipe is stopped with a cork instead of being capped, joints are imperfectly made, and escapes of gas are, of course, sought for with a light. Electric fittings may easily cause fire, and should only be entrusted to people of known skill and honesty. Such matters would be too obvious for mention, were it not that they are so often overlooked.

The fittings of old houses need to be inspected. I have at least four times had the narrowest escape from gas explosions, the effects of which most of us have often seen.

The common termination of an account of a fire, "cause unknown," requires a word of

comment. When a building is burnt out it may be impossible to trace the origin of the fire; when it is only partially burnt the evidence may be found. But there is an enormous number of narrow escapes which would give us useful lessons. In one of the extensive exhibitions which during recent years have been so common in the west of London, there were during a six-months season at least ten outbreaks of fire that were dealt with without troubling the Fire Brigade. To me, the chief interest of this branch of the subject is in showing that the fires which actually occur are not isolated events of comparative rarity, but probably the unlucky instances out of a very great number which did not happen to be caught in time.

Upon the whole it seems that structurally the greatest source of danger in a building, and the part that is most difficult to deal with in case of fire, is the roof. Whether set on fire from without, or during the progress of repair, or by an overheated flue, the roof, being well dried by heated air, possibly by sun burners, breaks into a full blaze in a moment, and is often destroyed before help can arrive. The fires at the Alexandra Palace, which I saw, and the Metropolitan Tabernacle are instances. The heavy timber roofs of churches and of large halls seem to invite these accidents. Some are even covered with tarred felt under the slates. There is no need for inflammable boarding to carry the slates, for we have now some choice of thin fire-resisting slabs which are easy of application. Steel joists will often span from one party-wall to another, and render unnecessary the roof trusses and all other woodwork. Iron-roof construction has become a great industry. A concrete flat can be used or a fire-resisting ceiling may be put under a roof of wood. On some of the best London estates fire-resisting roofs are now among the conditions of the leases, and, for buildings of any importance, inflammable roofs should soon become things of the past.

While I must insist that the duty of the architect and his responsibility are not bounded within the narrow limits of the Building Acts, these are most valuable as fixing a minimum of precaution which the most careless can be made to observe. Besides this, the powers of the London County Council under the Metropolis Management Amendment Act 1878, have enabled them to frame very important regulations for places of public entertainment; and their powers under the Factory Acts are causing a much needed reform in the limited class of factories and workshops to which they apply. As I have been very intimately concerned with the working of these enactments, I may venture to give some information and suggestions on each of the matters above named.

So far as I know, the control of the London County Council and the District Surveyors over questions of materials and construction gives rise to comparatively little dispute with architects of experience. It is when control is brought to bear on questions of planning, and when demands are made for greater space and greater facilities of egress, that the chief difficulties arise. These matters cost money, and diminish the sources of revenue from the building, and very few clients are able or willing to suffer in this way without a struggle. I have had to say to an architect, "You seem to begin by planning your auditorium and stage, and then squeeze your stairs and passages into any spare corners. You should plan first your stairs and passages, and if there is enough ground left you can have your theatre; if not, you cannot."

The requirement by the London Building Act of fire-resisting construction in a story the floor of which exceeds sixty feet in height, and the requirement of reasonable means of escape for persons dwelling or employed in a new building on floors over sixty feet in height, are very important. These people cannot be rescued by an ordinary fire-escape, and they may be unable to get down the staircase. If they did they would diminish the chance of escape for those on lower floors. Some arrangement is necessary that can be found and used by women and children, aroused, perhaps, in the middle of the night, with no time to dress, and

that will conduct them to a place of safety. It has been seriously urged upon me that the Council's discretion to approve means of escape includes a discretion to excuse them if there are serious structural difficulties, or if the cost of bringing the building up to a good standard would be great. Arrangements have been actually submitted that included locked exit doors, and light iron ladders nearly upright which might be used by a fireman, if he could find them, leading to a back yard with an exit only through the burning house.

The requirement of fire-resisting floors and staircases in those buildings only which are over twenty-five squares in area, tenanted by different persons, may have some justification; but I cannot think it is intended to excuse the omission of reasonable precautions in all buildings, even though those conditions do not exist. Again, the requirement in a dwelling-house or factory exceeding thirty feet in height of means of escape only if the roof has a parapet, and the allowance of a step-ladder and trap-door as a suitable means, seems to encourage the omission, in certain cases, of necessary means of escape. There should surely be in every case, particularly in lofty buildings, reasonable means of escape—or else reasonable security, if they remain—for persons, however few, and irrespective of the construction of the roofs. A room with fire-resisting floors and partitions and good doors, unless stored with inflammable materials, ought to be a safe place for some considerable time until means of escape can be afforded by the window, or until the alarm passes away. But roof-doors and other permanent means of escape from upper stories give rise to difficulties of their own.

It would be simple enough to run balconies or galleries along the fronts of houses on each floor or on alternate floors, or to make a short balcony across the end of a party-wall to give access from each building to the other. No doubt such means of escape, unless very carefully contrived, are liable to be used for undesirable purposes.

A common kind of accident is the burning of one of those three-story houses in roads where the ground story has been converted into a shop, or where this arrangement is reproduced in a new building. The upper floors of the older class of premises are commonly let out in tenements, or they may be partially used as work-rooms if the business is prosperous. A fire originating in the shop stops all egress from the upper floors, and its progress is often so rapid, that even in the daytime none of the inmates can escape in that way. Ordinary prudence would dictate the provision of efficient fire-resisting floors and partitions between the shop and the dwelling-house, with a separate entrance, and this idea was adopted in the Building Act of 1894. But these protective contrivances are limited to premises exceeding 1,000 superficial feet in area, which must exclude the great bulk of the premises that are subject to this particular danger. While I was hesitating between three or four instances that caused much sensation when they occurred, there came the burning of the five children in St. George's-in-the-East, to which I have already referred. And there are people willing to go as far as the Court of Appeal in order to escape this trifling necessary obligation! I suggest that we should never omit it, whatever the superficial area may be; and further, that we ought to try to get the limit of area abolished, and the law made to apply to old premises as well as to new.

Places of public entertainment have so many features in common, that it has been possible to compile regulations which are so well known that I need not deal with them in detail. When I began to be responsible in these matters the Metropolitan Board of Works had been for several years endeavouring by negotiations, requisitions, and arbitrations to effect much-needed reforms. But a good deal was still left to desire. It was still thought possible to get approval of the site of a theatre on a space enclosed by the backs of other property if there were one or two narrow frontages to streets. To one who brought me such a plan I said, "Surely Nature intended this for a coal-yard." But it was a timber-yard then—and I

think it is one still. I doubt whether even the best of the architects engaged on this class of buildings had much idea of the way in which they would be occupied and the amount of care that would be taken of them.

It is notorious that the great danger of fire arises on and about the stage. I have found the whole space under the stage stacked up to the under side of the wooden floor with scenery out of use, and every part of the stage with large scene docks connected therewith occupied in the same way, so that there was barely room for those engaged in the performance. I have found painting-rooms, dressing-rooms, and workshops contrived at the back of the scenery without any attempt to separate them. When we began to insist more strenuously on separate exits from every part with automatic bolts, these arrangements were rendered useless by storing all kinds of lumber in the passages, and by locking the exit doors during the performance, the key being kept at the box office till required. Frequently they have been barred and padlocked. Without saying that everything at every place of public entertainment is as one might wish, the alteration is striking, and the large numbers of new theatres that have been springing up in all our London suburbs have been designed by several architects genuinely desirous of doing everything that their clients can afford to do for the safety of the audiences. They have often been in advance of our regulations, one adopting, without compulsion, a fire-resisting roof, another a fire-resisting curtain, and others carrying out fire-resisting tiers and partitions. Where architects will do this, regulations follow, and do not lead them. I should like to say also that many proprietors have spent large sums in acquiring property and increasing their exits and providing separate storage for scenery, and in improving the accommodation for the audience, and the infrequency of accidents bears witness to the care that is taken in the management.

Let me note, however, how much we are behind Continental cities in these matters. In such cities the rule is to put a theatre in a wide space, or in a garden, with ample room all round. Beyond the open space is a separate warehouse where all the scenery is stored, and such precautions combined with ample exits are expected to render any serious accident from fire improbable.

I do not know how our provincial theatres are managed, but in one of those which were burned down within the last few weeks, sixty tons of scenery are said to have been stored on and about the stage. In addition to this, there was a huge and very elaborate stock of properties, and the dresses for the Christmas pantomime were there. When we remember how fatal at all times the fumes of burnt scenery have been to the audience, the gravity of this, if it be true, should cause serious thought.

In the matter of theatre construction a pamphlet by our Fellow, Mr. Alfred Darbyshire, of Manchester, on Theatre Exits will show how an architect of experience views the question.

The clauses in the Factory Acts passed during the last few years were drafted, so far as I know, without consultation with any of the public bodies who would have to administer them. The powers so conferred were not coveted by them, and the work is very considerable. Owing to the infinite variety of plan and the great difference in the goods and processes, it has been impossible to frame regulations of such uniformity as those made for theatres, but by the provision of alternative means of escape, clear of lifts and other sources of danger, with such fire-resisting construction as could reasonably be demanded, danger to life has been rendered highly improbable. I have had to deal with architects who could see no danger, and who, perhaps prompted by their clients, would neither accept nor make any suggestion; but this has been exceptional—in general the necessary improvements have been effected willingly. The house in which the Cripplegate fire originated was one of the first dealt with by the Council. If there had been no exit door to the roof, some sixty or eighty lives must

have been lost in that building. Great improvement in the new buildings on the Cripplegate area, effected by the harmonious co-operation of ground landlords and tenants, and their architects with the District Surveyor and the County Council so far as it has been concerned, will show what may be done under such conditions.

The flats of nearly all the new buildings are now of concrete and iron. Most of the buildings have at least two fire-resisting floors, generally that over the ground floor and that over the second or third floor. In many cases all the floors are of this class, the ironwork being covered up. Nearly all the staircases are fire-resisting, of the type approved by the County Council, to which the name of that body seems likely to cling.

With regard to factories, it may be useful for the architect to consider that though the processes used, when the means of escape are considered, may be particularly safe, the premises may in the near future be used for a comparatively dangerous process. It should therefore be made more secure than may seem at the moment to be necessary.

Once, in a Parliamentary Committee, I was asked by way of ridicule why it was not proposed to apply theatre legislation to places of public worship. My answer dealt with the comparative infrequency of accidents and scares in such places; but it was an imperfect answer. Though few in number, all the greatest calamities from fire have happened in churches, from that at the Abbey Church of Vézelay in the 12th century, when 1127 lives were lost, to that in the Cathedral of Lima, in South America, some seventy years ago, when 2,000 women lost their lives, hardly any escaping. In April of last year I was addressing a meeting on this subject at the very moment when the Metropolitan Tabernacle took fire from an overheated flue, and the roof fell in within half an hour. The congregation had sometimes numbered 6,000 people; the exits were few, and the time occupied in getting out was considerable; and we may imagine what would have been the result if, instead of being empty, the place had been occupied by a congregation, great or small. In the rebuilding both exits and structural arrangements are being very much improved. A fortnight ago the roof of the old church of St. Mary, Islington, took fire in exactly the same way, and I understand that this had happened before. There was a similarly lucky escape. I believe these places conform to all legal requirements, as do scores of others in London and the provinces, where similar accidents might at any time take place. The Building Act of 1894 supplemented the former requirements as to fire-resisting construction by fixing the width of staircases and corridors, and the outward opening of doors; but it is still possible to avoid providing the necessary number of exits, and to so place them that a fire such as not infrequently happens in an organ gallery would obstruct the means of egress and cause panic or a worse result. Such an accident happened a few months ago to a place of worship in Hull, when the morning congregation found the gallery and organ blazing on their arrival. I suggest that new legislation is desirable, and that a prudent architect should in all such cases go a good deal beyond the legal requirements.

One of the few instances of the careful provision of means of exit from a church will be instructive. It was a London church designed by the late J. D. Sedding, and on the opening I looked in at the end of the service to see how the wide exit doors at the west end would act. The whole church was packed with people, the passages being filled. At that moment the retrocessional hymn struck up and went on, but there was no room for the choir to pass down the church. The exit doors would have let us all out in a few minutes, but they were locked, and I was told that the key was in the pocket of the vicar, then standing inaccessible on the altar steps.

There is another matter allied to places of worship. All will now have a parish or congregational room. Let the architect beware of building such a room otherwise than according

to the County Council's requirements. It will speedily be required for entertainments and the more dangerous bazaars. In neither case can any reliance be placed on the care of the inexperienced and irresponsible managers, and if a catastrophe occurs it is as well that the architect should be able to show that the blame is not with him.

Someone, a philosopher in his way, once expressed his objection to doing so much for posterity that had done nothing for him. In a sense, we have to face the same consideration, and it is fitting that we should direct our attention a little more to our own interests in the present day. It is very important to the posterity which we are pampering in a good many ways that all our buildings should be handed over to them in the best condition according to our lights. But it is a hundred times more important to this generation that the old imperfect structures which so far exceed them in number, and in which the vast majority of us must live and work, should be made as secure as the buildings newly put up. While the chief justification of such a measure would be the security of human life, the loss of valuable property and irrecoverable works of art is a justification in itself. There is one class of property which, if the owners have good practical advisers, ought not to wait for legislation. I used to think that the old country mansions of our aristocracy and gentry were being destroyed at the rate of about one per month—one was burnt out three weeks ago. These accidents generally result from overheated flues, or from wooden beams near to the fire. Under skilled advice every place of contact of floor or roof or cupboard or wainscotting with the brickwork round a flue could be made secure, and the junctions of floors with walls could be made tight and many other things done to reduce the danger and give time for dealing with an outbreak of fire. A great deal more could easily be done. Sir E. M. Shaw has told us how much he would trust to good plaster well applied. It is possible to cover all woodwork exposed to danger with fireproof plaster, as beams in the dome of St. Paul's Cathedral were covered some years ago. The junctions of floors with walls could be made air-tight, floors themselves for two or three feet round the rooms could be pugged, and an old building could, without excessive cost, be made secure from the kinds of accident which usually cause fires.

There is a question about which I am now more free to speak than I was a few months ago—the question how far an architect should exert himself to minimise or to procure the omission of requirements laid down by the public authority for the safety of persons or property. He may think that when he has secured the certificate or consent of the authority to the reduced precaution, he has got rid of all responsibility. I cannot think this will hold good, but if it should, it will be a reason for greater hesitation on the part of the public authority in relaxing its requirements. Sometimes, by architects, but very far more frequently by persons acting for themselves, I have been strongly urged to assent to proposals which I felt to be risky. I have been driven to ask on whom it was proposed to put the responsibility, if things should go wrong, and the answers would generally be evasive. I think I liked best the reply of the man who said plainly that he meant me to be responsible. We understood each other.

In bringing this question of Fire Prevention once more before the Institute I am conscious that much which I have said has been said unanswerably in this room by Professor Hayter Lewis in 1865, by Mr. Alexander Payne in 1876, by Mr. Arthur Cates in 1878, and by those who so ably joined in the discussions. Information of very great value was also given to us by Mr. R. W. Gibson, an American architect, in a Paper read before the Institute in December last year on "Fireproof Construction of Buildings in America." I commend these papers in our TRANSACTIONS to your serious attention. Something will no doubt have been added to our stock of wisdom before we leave this room. But I cannot look without some apprehension to the speech of George Godwin on fire prevention, in which he remarked

how curious it was that "when such a thing had been attempted and had been found to succeed, and was well spoken of, yet it was allowed to die out!" It rests chiefly with our profession, and particularly with the members of the Institute, to see that, with all our modern experience and our modern advantages, we do not lag behind other countries in this matter, nor behind our duty and responsibility to ourselves and our own people in the protection of property, and more particularly of life, from fire.

DISCUSSION OF MR. BLASHILL'S PAPER.

The President, Mr. WILLIAM EMERSON, in the Chair.

MR. ARTHUR CATES [*F.*] sent the following contribution, which was read to the Meeting:—

I had hoped to have been able to be present this evening and derive pleasure and instruction from hearing Mr. Blashill's Paper on "The Architect in Relation to Fire Prevention," which from the abstract sent me on Saturday appears aimed to bring before architects the serious responsibility attaching to them in this matter.

I had also intended to endeavour to emphasise in the most forcible manner "the lesson of West Ham," where an admirably equipped Polytechnic Institute — recently erected and furnished at great cost—has been wrecked and much loss incurred, apparently because the very able and clever architects, possibly for economy, or merely following the customary routine, had been content to construct the roofs in the ordinary manner, without taking any "fire-resisting" precautions.

This lesson, one only, but the latest of a long series, should be taken to heart by all architects, and by all those who may have the control of similar buildings, private houses, and mansions, which have been built or are to be built, so that due precautions may be taken by modifying the existing dangerous construction, and securing that no similar error should be again committed.

For something like thirty years past I have been endeavouring to advance fire-resisting construction by imposing, as far as possible, conditions requiring it, in any important buildings which I might be able to influence or control. As experience has progressed and suitable materials become better known and more available, these conditions ultimately assumed the form that "All floors, partitions, and roofs should be fire-resisting, and all iron and steel construction, columns, stancheons, and girders, should be effectually protected by fire-resisting material." As regards the construction of roofs and protection of ironwork, I have sometimes found considerable difficulty in obtaining even partial compliance, the conditions being declared by architects of position, to be beyond the requirements of the Building Act, and vexatious and needless; but experience has fully proved their importance and value.

The provision of the Building Act as to roofs, that they should be covered with slate, tiles, metal, or other incombustible material, has probably led to the idea that this was sufficient protection; but this legislation is only the minimum, and solely intended to prevent the use of such coverings as tarred boarding or the like. The Act of 1894, in section 62, providing that any storey constructed in the roof at a height of above sixty feet from the street level, should be of fire-resisting materials throughout, has been a slight advance in the right direction; but if the condition stated, of a storey in the roof, does not exist, it would seem that the enactment has no effect, and the roofs may be constructed in the ordinary combustible manner. How much better it would have been to have simply declared that all roofs, the lowest part of which are above sixty feet from the street level, should be throughout of fire-resisting construction; or, better still, if the limit had been fixed at fifty feet. However, whether there is legislation or not, it is clearly incumbent on the architects of all buildings of any importance, public or private, to so construct the roofs as to prevent the occurrence of catastrophes, which so often arise from the ordinary system of roof construction.

There is in the Library a recently published book dealing with the subject of fire prevention in a very exhaustive manner—"The Fire-proofing of Steel Buildings," by J. H. Freitag, New York and London, 1899. In the chapter on "Fires in Fireproof Buildings (so-called)," the author mentions the dictum of a leading fire official in New York: "A building of brick and yellow pine in case of fire is easier to manage, and the contents have more chance of being saved, than in a modern *fireproof* building." This opinion will certainly, from a fireman's point of view, be confirmed by the experience of great London fires. The earliest instance I can recall occurred more than fifty years ago. I was engaged on the drawings of an addition to an old warehouse; the new work was carried out in the most scientific method of that day, as absolutely fireproof—with cast-iron columns and girders with brick arches—and we were very proud of it. Soon after the building had been completed and occupied and filled with goods, a

great fire broke out in it, with the result that our fine new scientific structure practically disappeared in a heap of rubbish, while the old warehouse, with its great timber posts and beams and thick well-tongued floors, escaped with comparatively little damage. Instances of this kind may be repeated over and over again, but they cannot affect public buildings or private mansions, which are not stored with masses of combustible matter, which, when burning, generate great heat, and maintain it for long periods* ; nor can they absolve the architect in these days from the responsibility of making the roof of his buildings, as far as possible, fire-resisting, protecting the iron construction from fire action, and taking all precautions to preclude the possibility of the rapid spread of fire.

Two instances may be mentioned which appear to justify these remarks. So far as could be seen from the outside, the roof of a quasi-public building recently erected, in which a valuable library will be housed, has been constructed in the ordinary manner, of fir rafters and boarding, without any provision for protection from fire, while the greatest care has been taken to render the floors fire-resisting; and in one of the prominent West End streets a very handsome stone-fronted shop building just finished is carried by iron or steel stancheons on the ground floor, all exposed and unprotected.

The immense importance of the subject, and the certainty that, when a roof of ordinary construction is well alight, it is difficult, if not impossible, to extinguish the fire, and that even if success therein is attained, it can only be by the lavish application of water, hardly less destructive to the contents of the building than fire itself, lead me to venture to suggest that those who have the charge of the great buildings containing our National treasures of Nature and of Art should see that effective measures are promptly taken to place any such roofs as may require it—should there be any—in a reasonable condition of fire-resistance. No question of economy should be allowed to intervene, and delay the prompt and effective execution of such works as may be necessary, if at all, to preclude the possibility of a catastrophe which might involve the destruction of national treasures of inestimable value.

Without venturing for one moment to presume or even to suggest that they are intended to be otherwise, it would be a great public satisfaction if an assurance could be given that the roofs of the new buildings of the Victoria and Albert Museum, South Kensington, the Royal College of Science, the new Public Offices, &c., will be so constructed as to be perfectly fire-resisting.

* Light goods, however, will produce intense heat and burn with great rapidity, as evidenced in the case of the Portland Bazaar many years ago, where the most remarkable destruction and distortion of the iron girders was caused in the few minutes the fire lasted.—A. C.

I am well aware that great confidence is placed in having plenty of fire hydrants in and about a building. Not for one moment would I depreciate their value or importance, especially if they are ever ready for use. Too often the hose is neatly coiled as the centre feature of a fire arrangement, surrounded by the branch and other implements, and enclosed in a handsome glass case, like valuable objects in a museum. Thus, if required for use, the coupling up of hose to hydrant and branch to hose is necessitated, operations which to inexperienced and untrained hands are not very easy, and in any case may lead to serious delay and confusion, which would be avoided by the hose and branch being kept coupled up to the hydrant ready for immediate use. But "prevention is better than cure;" and however complete the fire hydrant service may be, it does not in one atom diminish the necessity for the construction of the roof being fire-resisting, so as to prevent that remarkable and sudden spread of fire which a solitary hydrant here and there could not effectively combat or control.

The severe test experiments conducted by the British Fire Prevention Committee are affording means for judging of the comparative fire-resistance of various materials, and collecting information of great value, which should much assist architects in the selection of such materials as may be most likely to minimise the spread of fire; and it is much to be regretted that for some mysterious and unexplained cause the Executive Committee should have decided to withdraw from sending an exhibit to Paris next year.

There are many other important matters which might be dealt with, such as the avoidance of continuous hollow spaces under floor surfaces and in partitions, at the back of skirtings, dados, and wall linings, the external protection of window openings in light areas and narrow streets, the prohibition of composition tubing for gas services, the regulation of swing burners to avoid contact with combustible material, &c., while not the least source of danger is the present mania of the shopkeeper to have his shop front all plate glass undivided by piers, with grand stone façades above the ground floor resting on iron construction, so arranged that no apparent support is visible—this and the extension of shops over the forecourts of suburban houses, including many in one establishment, would seem to need some legislative action to control.

The warmest thanks of the Institute, of the profession, and of the public are certainly due to Mr. Blashill for having so kindly undertaken to fill up a gap in our Proceedings, by placing before us the result of his long and varied experience in the official position he has held with so much credit to himself, and aiding in the consideration and discussion of a subject of such vital importance to the community.

MR. D. S. WATERLOW, Chairman of the Building Act Committee of the London County Council, who rose on the invitation of the President, said he was not an architect, and in speaking on the question of fire protection, he spoke simply as a layman to professional men. He would only speak so far as his experience guided him with respect to his official work in connection with the building regulations enforced by the County Council. The Committee over which he presided, he was afraid, might be considered the *bête noire* of architects; it had a difficult work to perform, and it had an unpleasant task at times to persuade architects and building owners to do what the Committee considered the right thing. With regard to the Building Act, as they all knew, there were certain fixed regulations that were as the laws of the Medes and Persians which change not, and there were other permissive regulations as to which the permission of the County Council had to be obtained before they could be utilised. It was with the permissive regulations that he would deal that evening. These permissive regulations related to factories, under the Factory Acts; and under the Building Act to high buildings where the floors were more than sixty feet above the ground; and under the Metropolis Management Act the regulations were with regard to theatres. Those were the three things dealt with by the Committee; but what mainly concerned them was the efficiency of the means of saving life. On that question they were in a different position from architects and building owners. They had not to consider the question of cost. That had to go by the board where the people's safety was concerned. With regard to theatres, one great feature they had to deal with was the avoidance of panics. It was not so much the prevention of fire as to get the people out of the building before they were suffocated by the smoke. Smoke was the one thing they had to deal with; not the rapid spread of the fire, or whether it would consume any particular construction quickly, or whether that construction would resist for half an hour or more. Smoke was the dangerous element where human life was concerned, and as a consequence they had to see that where large bodies of people were collected there were rapid and effectual means of getting out of the building which the people would not easily mistake. The question was the avoidance of panic so as to enable the people, even in case of a very small fire, to get away rapidly when once they were frightened. With regard to factories, the work of the County Council had been much criticised, partly because there had not been, comparatively speaking, a very large number of serious accidents in factories. But there was great risk involved in factories. Having been engaged as the manager of a factory containing 700 or 800 people for fifteen years, he had had considerable experience in factory work. The work done by the Committee in relation to factories was on similar lines to the work connected with theatres, only that in many of the factories, particularly the older buildings, absolutely no attempt had ever been made to provide for the safety of the people employed. There were at the present time hundreds of factories in London with nothing but a plain wooden floor, and a plain open step-ladder staircase. Those factories often contained on the upper floors some forty or fifty women, with nothing but a single staircase with an open step-ladder construction for the whole of them to come down by. If a small factory fire, arising from a heap of shavings or straw, occurred upon the ground floor or basement, it created a vast volume of smoke, which filled the staircase and prevented anyone descending it. Consequently a panic seized the women on the upper floors, and they leapt out of the windows, and so a fearful disaster occurred. In order to cope with such a state of things, the Committee were endeavouring to put in force such regulations as these: that there should be one thoroughly good fireproof staircase, and, if the factory was a comparatively small one, that beyond that there should be some alternative means of escape, by which people could get away without much risk—either it should be over the roof, or down some other staircase in a remote part of the building, or by some other efficient means. He had himself seen some thirty or forty women get scared in a small fire that was scarcely worth speaking of, and it was impossible to control them for several minutes. Knowing what he did of factories in London, he was surprised that more serious disasters had not occurred in the past. So far as the regulations under the Factory Act were concerned, the County Council had no compulsory power unless more than forty people were employed on the ground floor. But there were a large number of factories in which there were less than forty people; and it was not an infrequent occurrence for the owners to reduce the number of their workpeople so as to avoid the regulations, with the result that a large number of factories which they knew to be most dangerous passed out of their supervision. Here was a recent experience. There was a small factory in which only eight people were employed. It had a step-ladder going up from floor to floor. A small fire occurred, the step-ladder caught, and the smoke rushed up the staircase. In five minutes the place was in flames, and of those eight people one failed to escape, probably overcome by the smoke, and his burnt remains were eventually discovered on the premises. That showed the necessity of preventing the smoke from filling the staircase, and that was one of the things the Committee were striving after. Recently they had at the County Council a case where the factory owner had done almost everything the Committee demanded of him.

But there was one trifling thing more they wanted him to do, viz. to make a fire-resisting partition from the foot of the staircase to the exit door into the street, and a fire-resisting floor at the foot of the staircase leading into the street. He came to the Committee and said he did not think this was a necessary thing to do—it was a small matter, and he hoped the Committee would overlook it. He (the speaker), upon the advice of his officers, had to point out to him that this was an essential feature; that even if a little fire took place underneath that bit of wooden flooring the smoke would come through the floor and fill the staircase and render it useless. Eventually he was satisfied with their arguments, and agreed to do what was required. That was a case where a man was proposing to spoil his ship for the proverbial ha'porth of tar. With regard to high buildings, and means of escape from them, the Committee was endeavouring to make the latter as effective as possible. As his home was some distance from town he had frequently to pass the night in one of their great London hotels, and the question was always present to him, when his room was on the sixth or seventh floor, how was he to escape if the lower floors caught fire? He knew his way from his room to the lift, and that was all. With such a state of things existing, as it did in numerous hotels in London, what a terrible position women and children and men would be placed in, should a fire occur in the lower floors of such buildings! The County Council could only deal with new buildings so far as this matter was concerned; but his attention had been seriously called to old buildings, and he would ask architects to bear in mind this question, when called upon to make alterations in some of the large buildings or flats that existed all over London, and over which the County Council had no jurisdiction whatever, because they were old buildings. This question of escape from fire should be carefully borne in mind, not only in buildings where the roofs were sixty feet above the ground, but also in buildings where the roofs were fifty feet and even forty feet above the ground, because there were many public and semi-public buildings in London which were in great danger from fire. In the fire at Hyde Park Court, not long ago, there was the narrowest escape from disaster, as there were hundreds of people in the building at the time. Finally, they must bear in mind that where the public safety was concerned the question of cost must be put aside—the safety of the people was the first consideration.

Sir JOHN TAYLOR, K.C.B. [*F.*], said he had great sympathy with the object Mr. Blashill had in view in bringing this matter before the Institute. Mr. Blashill had alluded to the fact that sufficient progress had not been made in regard to the fireproofing of buildings. The National Gallery was the earliest example of fireproofing he (the speaker) knew of. The floors of that building were of fire-pot construction, *i.e.* of arches formed with fire-pots, which was practically fireproof construction. Brick and concrete with iron girders and joists had taken the place of that construction of late years; still, when Wilkinson introduced the use of fire-pot construction into the National Gallery, he was rather ahead of his period. Mr. Blashill's remarks with regard to construction were, from a purely fireproofing view, extremely practical and proper. But there were difficulties connected with such construction. For instance, there was the actual laying of the wooden floor immediately upon the concrete, and the ceiling of the floor coming immediately below the construction, whatever it might be. In a public building there were a great many communications to be formed in the nature of telephones, gaspipes, electric bells, pneumatic bells, &c. If the floor were laid directly on the fireproof construction and the ceiling directly under it, all those communications must be exposed. True, some of them might be exposed conveniently and without any great disfigurement to the building; but in many instances it would be extremely inconvenient if the pipes and wires were all open to view. He had found it desirable to have a thoroughly fireproof floor in construction, but it was also in many instances desirable to have a space underneath in which to carry the pipes and wires. Mr. Blashill had mentioned the question of a building with a wooden roof upon it. As regards public buildings that had been practically abandoned, and he did not suppose that wooden roofs on any buildings of an important and permanent nature would be adopted again. The latest buildings with which he had been connected, the new Admiralty Offices and the Record Office, were absolutely fireproof. The roof of the Record Office was not only constructed of iron, but the covering was of iron also. There were no slates or tiles or anything of the kind. It was composed entirely of iron plates, so that in the event of fire there was absolutely nothing to burn. The iron construction was not cased, but it had a fireproof ceiling immediately underneath. With regard to Mr. Cates's remarks as to the fate of future public buildings, he could only say that the greatest care would be taken to carry out the buildings in a perfectly fireproof manner. He was sure Mr. Brydon would do his best in the construction of the roofs of the buildings with which he was concerned, and he had no doubt Mr. Young and Mr. Aston Webb would do likewise. There was one thing which always tied their hands more or less—the question of cost. People asked, what did it matter how much it cost if the building were perfectly fireproof and of the best construction? That was perfectly true, and he agreed with them. But the difficulty was

how to get the money. When he was being examined before a Committee of the House of Commons some eight or ten years ago, he put forward an estimate of something like 1*s.* to 1*s.* 2*d.* a foot cube for the completion of a public building. A very prominent member stared at him and said: "1*s.* 2*d.* a foot! Why, I know of a building for offices which has been constructed for 8*d.* a foot quite recently." The building constructed at 8*d.* a foot, referred to by the member of the Committee, was in one of the station yards in London, and was intended for the offices of the railway company. His only answer was that he did not think the public would be quite satisfied with a stock brick building in St. James's Park! That showed how difficult it was to get the necessary money to equip buildings in an effective and complete manner. As far as he was concerned, no effort would be wanting to get the new public offices and buildings constructed in the best and most fireproof way.

Mr. W. E. RILEY [*A.*], Superintending Architect to the London County Council, said that Mr. Blashill's very interesting and capital Paper concerned them all very nearly, both those who designed buildings and those who were responsible for the safety of the public. With regard to theatres, the County Council regulations did not attempt to save the stage part of a theatre; the auditorium and the parts devoted to the public were, on the other hand, carefully considered in every case. He had received, a day or two ago, the latest legislation on Building Construction, viz. the New York Code which came into operation last Tuesday. In some respects it was exceedingly successful and to the point. The code had been under revision for two or three years, and had been framed by a commission of architects, civil engineers, and representatives of all the building interests, including masons, bricklayers, carpenters, and plumbers. It was administered by a superintendent of buildings, who did not appear to be controlled by a county council, though he was not aided by a staff of district surveyors. He should like to say a word or two for the district surveyors, who were a much abused but a very useful and a very capable body. They were all gentlemen of high professional attainments, and they did work which was not popular in an able manner, with much tact. In the New York Building Code, which had just come into operation, many changes were made in building regulations. The first general improvement it adopted was as to the height of public buildings. A "public building" in New York had a much broader meaning than in London. The expression embraced a restaurant and a lodging-house, no matter how many people were accommodated in it. The limit to which such buildings could be erected without employing fireproof construction was thirty-five feet in height. There was no limit at all with regard to the area. There were, as they knew, abuses in regard to what were vulgarly called "sky-scrapers," which had led the controlling authorities in the United States to be considered very far in arrear of other building legislatures, but he was amazed to find that every building, of whatever character, which was seventy-five feet high, must be constructed throughout of fireproof materials. In sites for theatres, for instance, they now adopted the general rule in London of obtaining one side street and one main street in front. If they should want to build, as Mr. Blashill humorously said, on the site of a coal yard, the New York Code insisted upon having seven-feet passages on each flank; that is, the front must give out on the main street, and seven-feet passages must be provided on each flank if 1,000 people were to be accommodated. If 1,800 were to be accommodated, the passages must be eight feet; and if over 1,800 the passages must be ten feet wide. With regard to recent designs for theatres in London, it was a matter of surprise to him why they always resorted to a staircase. In New York they adopted a much more practical and common-sense mode of reaching the street—viz. by what sailors called a "brow," *i.e.* a slope. The slope was confined to 1 in 12, so that every part of a theatre and every corridor on the ground floor must communicate with one of those passages, having not less than two exits into the passages. The slopes were of fireproof construction enclosed in brick walls, with fireproof ceilings having a rise or fall of not more than 1 in 12. The vertical step of any kind whatever was in future, he understood, prohibited. That was a very important regulation in the improvement of theatre construction. The planning necessary for such a structure would no doubt be exceedingly difficult, but, as they all knew, planning was the test of every good design. There was more imagination in the man who could make a good plan than in the man who made a good elevation; at any rate, that was his experience of the work that came before him. If he got a good plan he was bound to get something practical on the top of it. There was another recommendation in the New York Code that had a very important bearing on a matter which gave a great deal of trouble in regard to theatre and music and dancing legislation in London. In New York they never allowed any place of amusement where the public could assemble—there was no limit of number—to have any connection with either an hotel, a lodging-house, or place of that kind. That would bar all the assembly rooms and music-halls attached to public-houses. As he had already remarked, he looked upon the back part of the stage of a theatre as designed to disappear; the fireproof curtain came down at once, and forced the smoke and flame from the inflammable material through an opening in the roof over the stage. That was a

very sensible arrangement, though very few of the old theatres had fireproof "flies." He knew one instance where there were at least forty operatives engaged in the flies of a London theatre, and he trembled to think of the probabilities if a fire took place on the stage of such a theatre; they would drop the fireproof curtain, and the poor operatives in the flies would be grilled. In the new code in New York they had adopted fireproof flies. The ceilings of the auditorium and all the partitions and enclosure were to be fireproof. All who were familiar with the boxes of the old theatres must be aware how inflammable such places would be if fire broke out. In the recent theatre fire at Newcastle, the only part of the building that was left was that portion which was of fireproof construction; the roof and every part of the ceiling was gone. Alterations had been made at a cost of some £15,000 or £16,000 only a few years ago, and those were the portions which were supposed to have been rendered quite safe. He had collated the latest information from various countries respecting the comparative regulations for planning of theatres on three important points, and embodied them in the following table:—

—	1. Staircases	2. Whether theatres shall be detached buildings or not	3. Floor of pit
London . .	To be 4′ 6″ wide for 400 persons, and increase of 6″ for every further 100	May be either attached or detached	Must be not more than 6″ above street, and not lower than 15′ 0″ below street
Italy . .	To be provided as required by Authority	Must be entirely isolated, with exits on each side	On a level with the street or not more than 6′ 6″ above such level
Lower Austria .	Sufficient to empty the theatre in four minutes	Must be entirely isolated, and not less than 49′ from boundary of the land on which they stand	Not higher than 6′ 6″ above level of street, and to have inclined planes (no steps)
St. Petersburg .	4′ 8″ wide for every 150 persons	Open space to be provided on every side, and windows on every side	No information
Berlin . .	As required by Authorities	No information	No information
Paris . .	No staircase to be less than 4′ 10″, and increased in width or numbers as required	May be either detached or attached, but if latter an independent wall must be built to protect party wall	No provision
Brussels . .	3′ 3″ for every 100 persons	Entirely isolated by open space or by brick walls not less than 1′ 10½″ thick	No provision

He had looked up particulars from various sources about the great fire at the Hotel Windsor, New York, and he thought they were interesting enough to mention on the present occasion. Accommodation was provided in the building for about 500 persons in addition to servants; the hotel was quite full when the fire broke out. There were more than 500 rooms in the hotel, and each was fitted with a safety rope, but they were not successfully employed, as women lost their grip in using them. The enclosing walls were of ordinary brick construction, the rooms being divided by stud partitions, and the various floors formed by boarding on wood joists. The internal walls, where they existed, were in many instances battened and wainscotted. The cavities and spaces thus formed flues which could hardly have been more effective if they had been designed for the destruction of the building. The two main staircases were of ordinary wood construction, having rough carriages, wooden treads and risers, and plastered soffits. There were balconies and iron escape ladders on three sides of the building, probably a total of six external escapes on each floor. The hotel was planned with a large central hall with double staircases extending on either side. The entrance hall ran from the front to the back of the hotel, and was a long and spacious thoroughfare, but this did not prevent the flames and smoke being drawn upward as through the draught of a flue. There was one passenger elevator and a goods lift; these structures no doubt contributed to the rapid progress of the fire. The building was reputed to be fireproof, but the Fire Commissioner declared that the building was one of the worst fire-traps in New York. There was great difference of opinion as to the cause of the disaster, but wherever the fire broke out it was probable that it had been smouldering for some time in some confined space before it was perceived, generating inflammable gases, which spread through the hollow floors, partitions, and cavities of the building until they suddenly ignited and involved the whole structure. The custom of artificially heating all buildings in the United States in winter so desiccates the resinous woods

generally employed in their construction that they spread fire with a rapidity that can hardly be realised in our moist climate. It was stated that within an hour from the first alarm the entire block was practically destroyed. The building generally was heated by steam conveyed in pipes. There were complete arrangements to provide against fire, and the members of the staff were instructed in the use of the apparatus on the premises, but the organisation failed at the critical moment, and a panic resulted. This was borne out by the statement made on the authority of the Chief of the Fire Brigade, that the majority of the victims lost their lives through not knowing where to find the stairs, having invariably used the elevator. The elevator was so much an institution in American hotels that this opinion ceased to be surprising; and he (the speaker) had searched in vain for any record of the guests having used the iron escape ladders which were provided. If the main staircases were not known it was hardly likely that those communicating with the balconies could be. One of the lessons taught by the fire was that a high building of this character should be constructed throughout with external and internal walls, partitions and floors of fireproof material. No cavities should be formed in either the vertical or horizontal construction except smoke flues and ventilating inlets and shafts. Resinous woods should be excluded from the carcass and used sparingly in the finishings. No hotel should have more than six floors, devoted to guests, above the level of the pavement. All staircases should be enclosed with substantial walls and be constructed of fireproof materials; they should be clearly indicated by printed notices on every floor. One staircase should be provided for every 100 persons accommodated. Lifts should be encased in brickwork, and provided with a restricted number of openings to the various floors, and those of the smallest possible aperture. Each floor should be provided with fusible water sprinklers to flood the lift shaft as soon as possible, and so keep the fire down in these openings, which add to the danger of its spreading when it breaks out in the lower floors. Fires which spread rapidly are deadly whatever facilities are provided for escape. The position of the dead bodies in another New York fire indicated that the inmates had excellent knowledge of the facilities for exit; the staircase was practically intact, but the victims appeared to have been overpowered by smoke and heat, which probably ascended the well of the stairs and made the normal egress impracticable. A period of five minutes was a long time for human beings to be in an atmosphere rapidly losing its oxygen, and in lieu being charged with stifling smoke, and he was driven to the conclusion that the best means of escape possible would only prove effectual when the buildings were so constructed and arranged as to prevent, with certainty, the rapid spread of fire and smoke. The heating arrangements of New York hotels in winter were a very great source of danger. The rooms are heated to about 70 degrees, and with the use of resinous woods in construction, a fire spreads with remarkable rapidity. This was indicated by the destruction of the house that was burnt down in Fifth Avenue last April. It had excellent means of escape. It was a substantial good-looking building, apparently designed so that it should enjoy immunity from burning in any case; and the staircase was practically intact. There was an illustration of it published in the *Daily Graphic*, of the 19th April last, which showed the position of the bodies and how efforts to escape had been clearly made by the occupants, who had evidently known the whole plan of the house, but had failed to reach the staircase. Mr. Waterlow had made some excellent remarks as to the necessity for keeping smoke out of buildings. People were very seldom burnt in these fires, they were nearly always asphyxiated. In the great calamity which occurred at the Opéra Comique in Paris, many of the people never moved from their seats; they were found asphyxiated where they sat. If one considered the immense consumption of air that took place in feeding a fire, one realised with what marvellous rapidity people ceased to be able to breathe. Even if there were no smoke to asphyxiate, they would quickly become unconscious from want of air. In conclusion, he expressed his appreciation of Mr. Blashill's able and instructive Paper.

MR. EDWIN O. SACHS, Chairman of the British Fire Prevention Committee, said that though it had been his good fortune to hear many Papers in different parts of the world, seldom had he heard such an instructive Paper as Mr. Blashill's, where so lofty a tone was observed in giving the general principles of fire prevention, and avoiding details of materials for fireproof construction and the like. There were two great features of the Paper he should like to refer to. The first was that architects were too prone to think that the fire prevention provided for by the Building Act was all that was required. The Building Act, as Mr. Blashill and Mr. Cates had pointed out, was the minimum—the absolute minimum; and this, if he might use a slang expression, ought to be "rubbed into" the junior members of the profession, who were growing up and destined to influence the architecture of the future. Laws ordained the minimum requirements, and architects should aspire to do a great deal better. The other point was the question of old buildings. It was a very knotty point how to apply fire prevention voluntarily to the old buildings. The great difficulty of the client had to be overcome. The client in nine cases out of ten would not think of fire prevention. They

could not get their clients to think of fire protection in the same way that they thought of drainage. The moment the ordinary building client could be got to think of fire protection in the same way that he now thought of drainage, there would be some hope. Not until then would we get well-built buildings in the older and more dangerous parts of a city. Reference had been made to theatre safety. Personally he preached exit before construction. The great point was to get people out. Speaking from the official point of view, he would certainly say let the theatre burn down, that did not matter if only the exits were good and the people were got quickly out. If the theatre owner stupidly chose to let his house burn down, that was no concern of the public authority as long as there was no risk to life and limb. As regarded factories, the growing tendency was to put factories outside the area of the county of London, not perhaps, as some might suppose, to avoid the Factory Acts as applied in the county of London, but to have the many other facilities which factory building outside that area brought with it—namely, space, room, air, light, &c.—and the more they could encourage factories going outside the area, the better it was for London generally. Regarding the other classes of building, the hotel question, one of the most important, had been absolutely neglected. Nine out of ten hotels in London at the present moment were death-traps. He had gone over many of them from a fire point of view, and he was sure gentlemen who exercised public control over buildings would bear out his statement. It was high time something should be done to buildings where people congregated at night as well as by day. He should like to be allowed to propose a vote of thanks to Mr. Blashill for his admirable Paper.

Mr. H. HEATHCOTE STATHAM [*F.*] said that, with regard to theatres, he thought that all the considerations about exits brought to their minds the want of having what he would call a symmetrical site for theatres; so long as they had an angle site they got an entrance at one side, and the consequence was that at the exit all the audience crowded to one point. He happened to go into the pit of a London theatre two or three months ago, where there was a corner entrance; it was rather crowded, and as soon as the play was over he noticed that the whole of the audience were pushing to a corner towards the corner door by which they had entered. There was an emergency exit door on the other side, but they took no notice of that; they went to the door they entered by. If there were a symmetrical plan, and the people were got into a central lobby, and those at the right hand of the lobby were put into the right hand of the house, and those at the left hand of the lobby into the left hand of the house, the people would go out the same way as they went in; but when they enter at an angle, they make for the same place when they go out; and, if there is any panic, there they crowd and there the danger is. That was an important reason for getting symmetrical sites to theatres with an equal access at each side, and they were very much in want of that in London.

Mr. C. FORSTER HAYWARD, F.S.A. [*F.*], remarked upon the extreme carelessness that was one of the great causes of fires. Mr. Blashill had referred to country-house fires. Only last night there was one within four miles of Windsor, the particular circumstances of which were worthy of note. The heating apparatus had gone wrong, and they determined to repair it at night, when the occupants of the house were in bed. The men came to attend to it, and by some means dropped a candle into a hole, where they could not get it out, and in a moment there was a blaze—the house was quickly full of smoke, and it was with great difficulty that the gentleman and his family were able to escape. That was a single case, confirming what he thought was one of the great causes of evil—namely, the carelessness with which these buildings were not only constructed, but attended to while they were being constructed, or while they were being repaired. He would mention one or two other cases that had come under his observation. Only the other day, when visiting a building, a large place of entertainment, for inspection in the ordinary course, at the very top of the roof he found four candles just stuck down upon a board, and the whole of the adjoining floors connected with the new roof, which was of wood, were covered with shavings, the *débris* of some carpenter's work. There was nobody about at the moment, and the slightest movement, accidental or otherwise, might have set the whole place on fire. Almost the next day he went into one of the largest hotels that was being built, and no sooner had he got in at the ground floor than he saw a quantity of straw smouldering, and there was straw all over the place, the room having been used for emptying packing-cases. There was nobody near it, so he put it out himself. These were two instances of carelessness within a week where two very large fires might have occurred unless some person had come in at the moment and put them out. That was one of the things he wanted to impress upon architects, to endeavour to get the contractors to have perfect control over fire and all risks of fire by more careful superintendence than there seemed to be at present. With regard to staircases in hotels and public buildings, and private buildings also, now that these were often constructed of concrete, patent or otherwise, built upon the spot, there was immense risk of the stairs in the smallest fire dropping down from the "attachment" into the walls (he used the word

advisedly) unless they were properly supported on the outer side. He had had to insist upon that very strongly, because he found that there had been one or two accidents when a fire occurred. For instance, in case of a fire in an hotel the people naturally rushed down the staircase, and if only one of the treads gave way at a corner or at the turning, and it was not supported on the outer edge, those who were on the stairs were liable to be immolated in the fire, and probably those above could not escape. A particular instance had come under his observation. Some six or eight years ago there was a very small fire at Montague Place, the houses in which back upon the British Museum, where there are as many as sixty or eighty large windows, most of them lighting rooms where priceless antiquities and MSS. are preserved. The fire occurred in a small building not above a story in height, but the fire spread into the hall and the staircase, which was of stone. Some ladies were about to descend the staircase when the stairs, not being supported on the outer side, gave way, and if they had been two or three steps further down they would have been precipitated into the fire. As it happened, they went back into the room and got out by the balcony and escaped. One result was to call the attention of the authorities to the danger that threatened our National treasures at the Museum by the likelihood of fire so near the Museum windows. Fortunately the engine of the British Museum was quickly got into action and put the fire out. But, apart from this great danger, the occurrence emphasised his remarks with regard to supporting the outer side of staircases. At the present moment there was a great tendency to build staircases of concrete and iron, in such a way that the construction was liable to collapse when attacked by fire. He had nothing to say against the principle of concrete staircases; properly supported it was as good a fire-resisting material as possibly could be; but in the practical working it was liable to great danger. He had much pleasure in seconding the vote of thanks to Mr. Blashill for his very admirable and valuable paper.

THE PRESIDENT in putting the vote of thanks, which was carried by acclamation, referred to what had been said about the apparent unwillingness of architects to go beyond the minimum they were legally required to go. He thought there was a higher feeling than that, which should induce architects to do their utmost in this respect—namely, the moral responsibility attaching to an architect who erected a building in which a disaster might result from his negligence. He did not know what the feelings of architects generally were when they erected buildings—he knew what his own were; but some of them would realise that moral responsibility most deeply, if such a disaster occurred to one of their buildings. The matter of exits was certainly more important than the matter of fire-resisting material, and he was confirmed in this from observations of his own in America. He remembered seeing two buildings in Chicago that were absolutely gutted; all the iron columns and joists had twisted like threads. He happened to be driving with three architects at the time, and as they passed the buildings he inquired who built them. Curiously enough they were built by a gentleman of the name of Burn—a very suggestive name, for both the buildings were completely burned. This gentleman declared that they were built in the most fireproof manner that was known at the time. Since then he believed they had done a little more in the way of casing iron in concrete; but the fireproof material employed in the buildings he had mentioned did not prevent them from being absolutely gutted. With regard to the difficulty of finding the way out of hotels, he remembered in an hotel in the south of England, and also in some hotels in America that he stopped in, there were skeleton plans of each floor hung up in every bedroom, and the exits were clearly indicated on the plans. It was a most reasonable thing, in these days of easy multiplication of plans, to place a plan of each floor with the nearest fire-escape and exit in each bedroom.

MR. BLASHILL, in responding, referred to the fire in Hyde Park Court which had been mentioned, At each end of the building there was a suite—that is, in front of the building there were two suites—of apartments, one to the right and one to the left of the staircase. One was burnt out and the other remained. The only difference he could make out between the two was that in one case the outer door of the suite had been closed, and in the other case it had been left open; they were simply ordinary doors. That showed what great effect the door had in preserving one of the suites. He quite appreciated the difficulty referred to by Sir John Taylor, in nailing a wooden floor close down on concrete. He could only say they must take care to get over it in some other way as well as they could. There was a fire-resisting building within seven minutes' walk of the Institute in which a fire took place and was spread through that cause, which did £3,000 worth of damage: so that that aspect of the case was worth consideration. He was much obliged to Mr. Riley for bringing to their notice the New York Regulations—they were extremely interesting. In the fire in the Exeter theatre about fifteen years ago the same phenomena occurred of people dying sitting in their seats in the gallery, A large proportion of the deaths in similar cases were of people who never rose at all. Dense volumes of smoke ascended instantly to the gallery, and the people died where they sat. He was glad they all agreed that the Building Act was the

minimum. They must drive that well home to their clients and friends. The Building Act was the minimum. They could put it to their clients in this way: "Here is a line drawn by Parliament —the Building Act; on one side you go before the magistrate, on the other side you escape!" No prudent person would like to run it quite so fine as that. He was extremely grateful for the way his Paper had been received, and he hoped their deliberations that evening would have fruitful results.

FIRES IN THEATRES.

Mr. Wm. Paul Gerhard, an American engineer, who has devoted much time and attention to the study of prevention of fire, has issued, through the British Fire Prevention Committee, yet another pamphlet on theatres, entitled "The Safety of Theatre Audiences and the Stage Personnel against Danger from Fire and Panic."

Mr. Gerhard opens by remarking upon the desirability of ever keeping this subject before us, and not depending upon the excitement of the moment caused by some great catastrophe before carefully considering the measures or precautions against the well-known dangers to life and limb in structures, which are either neglected or forgotten, and he refers to the flood of plans, pamphlets, newspaper articles, and revision of regulations which followed the calamity of the Ring Theatre in 1881, the Exeter fire in 1887, and the Paris Charity Bazaar disaster in 1897.

The writer of the essay gives some statistics of theatre fires, which, although interesting, can be of small use to the architect, because the development in theatre planning, construction, and lighting has during the past few years removed so many of the dangers from fire which formerly existed, when fireproof tiers and fireproof curtains were almost, if not entirely, unknown. Mr. Gerhard then enters in detail upon his subject under five headings. He first comments upon the means that should be adopted for escape in case of fire, and it is regrettable that the author of this paper is unable to give us any suggestion that has not been fully dealt with by previous writers on the subject. There is little in this section of the paper that is not already contained in the regulations of the London County Council; and little that is not carried out by British architects whose practice lies in this direction.

The theory that each division of the audience should have two entirely separate exits, at least 4 feet 6 inches wide, is the basis of the whole of the London County Council regulations. That clear and good planning will greatly contribute to the safety of the audience is admitted by all authorities; and the carrying out of this in erecting a theatre does much to secure the quick and safe departure of the audience.

In 1884 the Society of Arts published a paper of mine, in which I went a step further and advocated symmetrical planning: where an entrance is placed on one side of the house an exit should be planned on the other side in a relative position. The condemnation of "emergency" exits is a very right and proper one, and I quite agree with Mr. Gerhard's approval of that entirely English arrangement, a sunk pit, a form of planning so frequently adopted by the late Mr. Phipps. This arrangement, as is pointed out, reduces the height of the gallery above the street, and shortens the exit from the most dangerous part of a theatre.

In the Abbey Theatre of New York City, Mr. Gerhard tells us, the exit doors are controlled by electric openers, which are operated by pressing a button, either from the stage or from the manager's office: the device seems to me to be more ingenious than safe, as the operation depends upon the presence of some individual to press the button, who would probably be the first to run for his own life on a call of alarm. The automatic bolt in use in England, which can be opened by anyone by pressure from within, appears to me to want a lot of beating as a safe door-fastener in a theatre.

Mr. Gerhard treats fire-resisting construction as "by no means absolutely necessary;" he depends for safety upon good planning. I am with him so far as to say that bad planning with fire-resisting construction has its attendant dangers; and that an ill-planned fireproof staircase may not prove to be as safe as a well-arranged wooden one; but, at the same time, as far as the exits are concerned, I do think fireproof construction absolutely necessary. I cannot, however, agree with some members of the Fire Prevention Committee, who carry their fire-protection theories so far as to require the steel work and cantilevers of which the tiers are constructed to be embedded in concrete, in addition to the protection already provided by wire lath and plaster ceiling. My opinion that this is unnecessary is borne out by the Fire Brigade officers, who look upon such protection as a danger to them, as the concrete is bound to fall in lumps from an unexpected source when a great heat reaches the cantilevers.

Mr. Gerhard next speaks of the necessity of the actual test of time required to empty a theatre, and gives several examples. It may be interesting to note that at the Camberwell Theatre of Varieties, which I have recently erected, there were 2,500 persons present on the opening night, and that it only took one minute to empty the building on that occasion. This leads me to the next point in the paper, which deals with width of staircases, and to note the remark that "very wide stairs should be divided in the centre by a rail." With this I do not agree, as I think a staircase should never be made so wide as to require a central handrail. Six feet should be the maximum width; and if this is not wide enough to carry off the people, then an additional and separate exit staircase should be

made. It is this system that I have adopted at the above-mentioned Theatre of Varieties.

Next, as to width of seats, Mr. Gerhard speaks of 18 to 21 inches as sufficient. I agree with him. The London County Council's rules will not allow a seat, which is in any way divided as a separate seat, to be less than 20 inches. If the seats are continuous, as in the gallery of a theatre, then the people, as is well known by experience, sit much closer than even 18 inches. That the seats should, where there are backs, be tip up, or, as Mr. Gerhard says, "flap seats," is most desirable; in order to "afford more room between the rows for people passing between them."

The separate system mentioned of lighting exits entirely, independently from the stage and auditorium, is one which has long since been adopted in London, and is a most necessary precaution for the "safe retreat of an audience."

Section II. deals with the measures tending to prevent an outbreak, and for quickly detecting and signalling a fire. First, there is the essential question of site, and the avoidance of adjoining risks by isolating the building, or separating it by strong party-walls, where an isolated site is not attainable. Two streets are required in London; but Mr. Gerhard points out that in recent American "theatre buildings a compromise has been effected by making provision for wide courts on both sides:" a provision which every architect knowing the value of land would ask the authorities seriously to consider in the metropolis, as safety can be attained thereby quite as well as through the present system of creating unnecessary thoroughfares at enormous expense, for the necessary lands and roads required by the present London County Council rules.

We hear that these rules are now under consideration for revision, and this is a point which the Council would do well to reconsider; it would allow the continental system of external staircases, which permit the immediate discharge of the audience into the open air, at whatever level the public may be—gallery, balcony, or pit. There is, indeed, much to be said for the system, at present entirely excluded by the regulations enforced in London, quite apart from money value, which alone is an important consideration.

Mr. Gerhard, under this section, again refers to clear and symmetrical planning, and the open-court system would greatly add to the carrying out of this most desirable end, as both sides of the house could be made identical. With a street in front, and another at one side, this is impossible; with a street in front and courts at *both* sides, it can easily be done. Again Mr. Gerhard lightly passes over the question of construction so far as the auditorium is concerned, but he dwells fully upon the stage as being the chief danger point of a theatre. Briefly, some of our authorities are satisfied if there is a fireproof separation between stage and auditorium, and if the stage is made as light as possible, with wooden roof and large ventilator to create quick draught to cause rapid burning out of the stage effects should fire occur. Mr. Gerhard advocates fire-resisting flies and grid-iron, chemically impregnated woodwork, scenery, and dresses, scenes covered with fireproof paint, and even "decorations" (which, I suppose, means scenery) of sheet iron or asbestos, wire ropes, and hydraulic or electrical appliances, to render as much as possible non-inflammable.

I am quite adverse to the wire rope suggestion, as a flaming cloth is frequently stamped out by cutting the hemp ropes, and letting the scenes fall on the stage.

The substitution of the electric light for gas on the stage has reduced the risks almost to a minimum, so far as directly igniting the scenery from the old and dangerous naked gas battens, and therefore for modern stage productions the suggestions made seem to go a step too far. When authorities differ as to the stage construction, as they do even in London, it is difficult for the architect to determine what course to pursue; but my experience teaches me that the theory of the London Fire Brigade is correct—*i.e.* a stage well divided from the auditorium by a double asbestos curtain, with a large ventilator for up-draught, and the contents such as will quickly burn themselves out before the extreme heat has power to affect the more solid portions of the structure. One of the latest theatre fires in the North caused damage and destruction to a stage constructed on these lines, and the architect himself informed me that, owing to the asbestos curtain, even the draperies in the private boxes were not singed.

Careful watching is the best preventive of fire, as the writer of the paper under review remarks; and this watching must be both private and official.

Section III. deals with measures to protect the audience from fire and smoke, and here Mr. Gerhard describes the various kinds of so-called fireproof curtains, and remarks that "corrugated iron curtains are by far the best of all iron curtains, as they are strong and fire-resisting, and smoke-proof." Surely no corrugated iron curtain would ever resist the effect of heat caused by a stage fire, without twisting so much out of shape as to admit both smoke and flame into the auditorium.

In my opinion Mr. Gerhard is right in saying that a much more practical fire curtain consists of thick and strong woven asbestos cloth; there is no curtain like the asbestos curtain.

Ventilation as a preventive of fire is touched upon, and the provisions for opening and closing the ventilators to direct the draught towards the stage in case of fire, and to keep the smoke back from auditorium and staircases.

A wise provision, not always considered, of placing staircases next external walls, to obtain windows and ventilation, is mentioned by Mr. Gerhard. "Inside staircases," he says truly, "are bad, as the air in them may become full of smoke."

Section IV. refers to the means for protection of the stage personnel. Isolated dressing-rooms, the same precautions as to exits and staircases as for the audience, "leading into the courts on each side of the theatre," iron fire-escapes, ventilation, lighting, and the regulations made by the management are all touched upon.

As one would naturally expect from an American writer, under Section V. for means for localising and restricting a fire on the stage, the automatic fire-alarm system is mentioned by Mr. Gerhard. He wisely speaks of its efficiency when "regularly tried and maintained in good order." Without such precautions any automatic alarm is certain to add greatly to the danger of panic, for if it "goes off" at a high temperature, such as would arise on a stage, a stampede would commence, even if no fire had broken out.

Of the remaining sections, VI. and VII. deal chiefly with fire-brigade work—means of saving life and fighting outbreaks of fire; while VIII. dwells upon the means of guarding against panic. The keynote is struck in the words "much can be done to prevent dangerous panics by giving the audience a feeling of security."

I cannot close my remarks upon this paper without again referring to the differences of opinion expressed in print and otherwise by the gentlemen of the Executive of the British Fire Prevention Committee. We are told by Mr. Gerhard that one member looks upon fire-resisting construction as last in order of importance, and at the same time we find other members demanding fire-resisting construction, which the greatest authorities in the metropolis on fire questions—the Fire Brigade—say must add to the danger of a fireman fighting the flames. Knowing, as I do, and have done for the past ten years, Mr. Paul Gerhard to be a conscientious student of this subject, it is with great pleasure I advise, in spite of difference of opinion, the careful study of his Paper, as much valuable information can be gained therefrom.

ERNEST A. E. WOODROW.

Fire Risks.

A letter from Mr. Montague Crackanthorpe in *The Times* of the 19th inst. calls attention to a source of fire risk hitherto quite unlooked for. He says:—

One evening last week a fire broke out in my house with such apparent spontaneity and in so novel a fashion that some account of it may be both interesting and instructive. My wife and I were sitting in the drawing-room when we became aware of a smell of burning wood, and shortly afterwards perceived rings of blue smoke coming through the crevices of the boards close to the hearth and beyond the edge of the carpet. Hurrying towards the door, I had just reached the middle of the room when, to my surprise, my foot passed right through the carpet and the floor into the hollow space underneath, which is consecrated to joists and other woodwork. I then realised that the floor was ablaze, although, owing to the smothering effect of the carpet, the flames were confined to the centre. With the help of cans of water and of the fire brigade, which arrived after a few minutes, the fire was arrested without much damage being done. Had the flames burst forth after the household had gone to bed, or had another foot than mine stepped through the floor, the consequences might have been very serious.

To explain what had happened it is necessary to mention one or two details. Two years ago the house was lighted with electricity throughout, the supply being taken from the mains of one of the local electric-lighting companies. From the "rose" of the ceiling of the room below the drawing-room hangs a 32 candle-power lamp which is fed from an 18-gauge Silvertown wire. This wire (with two others of 16 gauge) is laid in the space above the ceiling, and is attached to two flexible cords, each consisting of 35 strands of very fine wire and covered with silk in the usual manner. The attachment of the wires to the cord is made by twisting the first round the second and soldering. By some unexplained mischance (for the fire destroyed all direct evidence of its own origin) these wires, or some of them, became partially stripped of their insulating coats, and so the current, instead of going through the lamp, found its way across what was at first a minute interval of air, but which, when the switch was on, was sufficient to set up a tiny arc-light at that point. This arc-light, the formation of which was probably assisted by oxidisation of the exposed wire, had a tendency to increase in size, and at last it became so powerful that, after consuming the wooden casing in which the wires are laid, and still further injuring the insulating fabric, it started a short circuit. This, of course, blew out the safety fuse, but not until the floor was well alight. The above theory is that of the electrical engineer who was responsible for the wiring, and also of the highly intelligent official from the electrical department of the London County Council, who, on the report of the fire brigade, called to inspect the premises. No question of overloading arose, as there was only one lamp on this particular circuit.

Mr. Crackanthorpe offers the following practical hints to users of electric light:—

1. If I were wiring my house afresh I would have no encased wires under the floors, but would lead them along the ceilings and the insides of the rooms so that they might be always in sight. If this had been done in the present instance the arc-light must have declared itself almost as soon as it was formed. 2. Instead of casing the wires in wood, as is the nearly universal practice, I would case them in asbestic plaster or some other fire-resisting material. 3. I would have the whole of my wires tested for leakage at least every twelve months, both by the earth test and the pole-to-pole test.

A New Fireproof Material.

The *Street Railway Journal*, an American publication, describes a new fireproof material. It is made of granite chips, pulverised, moulded into form, and fused together at a temperature of 3,000 degrees Fahrenheit. Its crushing strength is very high. It can be heated red-hot and thrown into cold water without being injured. It resists the action of acids and alkalies and is frostproof, having been tested by liquefied air at a temperature of 350 degrees below zero without injury. A test made at Niagara Falls showed that it required 56,600 volts to penetrate about one-half inch of the material.

9, Conduit Street, London, W., 23rd Dec. 1899.

CHRONICLE.

The New Vauxhall Bridge.

The following correspondence has passed between the Council of the Institute and the London County Council:—

8th November 1899.

Sir,—The Council of the Royal Institute of British Architects, having before them the report of their delegates who were so courteously afforded the opportunity of examining the drawings and models for the proposed new bridge at Vauxhall, desire most respectfully to submit the following points of criticism and suggestion for the consideration of the London County Council:—

1. The main piers should be increased in width if this can be arranged with the Thames Conservancy.

2. The great projection of the cutwater in front of the pier seems unnecessary in so wide a bridge. A flat band with slight projection would serve its purpose better than the large projecting capping. The form of the weathering upon the cutwater is unsatisfactory.

3. The semi-circular projection on the piers should be treated as part of the pier, and not as an attached column. (At present the stopping of the neckings to cap and base against the rustication is very awkward merely as a matter of detail.)

(4) The projecting quoins at either side of the pier upon the flat spandril of the arch have no significance and no architectural value, and should be omitted.

It is a question whether it would not be a distinct improvement to the pier to omit the semi-circular column upon the face of the pier and the detached column it carries altogether, and to treat the pier as a square one to the same design as the flat portion now indicated, but with greater projection.

This would obviate the awkwardness of the raking lines of the caps of the circular columns which has been ignored in the model and ¼-inch scale drawing.

(5) The arch, although increased in depth, is still painfully thin in appearance. Some expedient should be adopted whereby the voussoirs can be deepened.

(6) Having regard to the weakness of the arch as designed, we think it inexpedient to emphasise it by the heavy rustication. The treatment of Waterloo Bridge might be studied with advantage as regards both arch and spandril.

(7) There is nothing to show how the granite is returned under the soffit. The voussoirs should be properly bonded as quoins on the soffit.

(8) The alternate narrow and broad dies in the balustrade have a restless and unmonumental appearance. They would be improved by being of one size throughout.

It is a matter of question if a solid parapet would not assist the appearance of solidity which the bridge now appears to lack.

Generally speaking, the Council are of opinion that the architectural treatment and detail of the bridge lack that distinction of style and scholarship which may be reasonably looked for in a great monumental work of the kind, and they still feel that very great advantage would accrue if competent architectural advice were sought. The Council hear with satisfaction that it is apparently intended that one coloured granite is to be used for the whole structure.

I am directed by the Council once more to express their appreciation of the courtesy by which the opportunity has been afforded them of laying their views before the London County Council.—I am, Sir, your obedient Servant,

W. J. Locke, *Secretary.*

C. J. Stewart, Esq.,
Clerk: London County Council.

Spring Gardens, S.W.: 25th November 1899.

Sir,—I am directed by the Bridges Committee, to whom your letter of the 8th instant has been referred, to thank the Council of the Royal Institute of British Architects very sincerely for the trouble which the delegates of the Royal Institute have taken in examining the drawings and models for the proposed new bridge at Vauxhall and for the suggestions which are embodied in your letter. I am to assure you that those criticisms and suggestions will have the most careful consideration, without impairing the responsibility of the Chief Engineer for a structure which necessarily, and in accordance with every precedent, falls within the business of his department.—I am, Sir, your obedient servant,

C. J. Stewart,
Clerk of the Council.

The Secretary R.I.B.A.

Arts and Crafts in Australia.

It is gratifying to learn, on good authority, that there is a growing demand in Sydney and other large towns for art workers in various branches. The writer, who is one of the leading architects

in the Colony, says in a letter to a London colleague, "We are at a loss out here for good art workmen of all kinds. There are plenty of third-rate men, and there is only one highly-skilled worker in metal. There is a good opening in all branches, workers in wood, iron, stone and metal; also for stained-glass workers, modellers and designers in plastic materials, decorative painters, and men skilled in the working of marble and mosaic. Young men, with a small capital but with artistic capacity, would be the most suitable. If without capital, they could readily get employment here at good rates of pay. The one essential is that they should be good men. Of course, good men can always find employment 'at home.' But as there may be many with incipient lung or chest complaints, bronchitis or affections of the throat, this climate could not fail to be of great benefit to them. For general information as to the Colony, our Agent-General, Sir Julian Salomons, will, I am sure, if applied to, furnish all that is required."

The proposed British School at Rome.

The Institute has received from the executive committee the following communication respecting the proposed British School at Rome:—

The British School at Athens has now been in existence for thirteen years, and, in spite of its comparatively slender resources, it has won for itself an honourable place by the side of the older and wealthier Schools of France and Germany.

But a British School at Rome has still to be established. Germany, France, Austria, and now the United States, all possess more or less well-equipped institutions; Great Britain, almost alone among the great European States, is unrepresented.

The time has surely come when this omission should be supplied. For many years past excellent work has been done in Rome by British scholars, archæologists, topographers, historians, and students of art. Every winter season finds British students at work there in one line of study or another, while the number of educated travellers who visit Rome steadily increases.

What is needed in Rome is what is now provided at Athens, a recognised British centre of study and research, which should offer to British students the advantages which German, French, and American students already enjoy.

The establishment of such a School would be warmly welcomed by the Committee of the School at Athens, not only on general grounds, but because of the opportunity it would give to their own students to complete the training received at Athens by a period of study at Rome, and *vice versâ*. The two British Schools would in fact help and strengthen each other.

It has also been ascertained that the proposal has the cordial approval of English residents in Rome, and of H.M. Ambassador to the Quirinal.

The work to be done by a British School at Rome would in many respects be similar to that at present done by the School at Athens.

(1) It would be a training-ground for students fresh from the Universities or other institutions, who would receive there the help and guidance which are perhaps more needed in Rome, with its complex history and varied interests, than anywhere else.

(2) It would serve as a centre round which more mature students would naturally group themselves. Such a recognised centre would not only stimulate intercourse and sympathy between workers who are now isolated, but would, as the experience of the older Schools in Rome has shown, make more concerted and continuous work possible.

(3) The School would also, it may be hoped, prove of assistance to British visitors anxious for information and advice in the study of the perplexing confusion of monuments with which the traveller is confronted in Rome.

On the other hand there would be differences, due to differing conditions. In the case of the School at Athens the excavation of ancient sites has naturally formed an important part of the work. But a British School at Rome would, like the existing foreign Schools, be debarred from excavation by the rules of the Italian Government. Though, however, excavation is out of the question, there would be plenty of work to be done in topographical exploration, in the study of museums, and in the examination of the results yielded by the excavations undertaken by the Italian authorities. In addition, we may refer to the growing importance of the prehistoric antiquities discovered in recent years, and to the field for investigation offered by Magna Græcia and Sicily.

It is obvious, too, that in some respects the work of a School at Rome would be more many-sided than is possible at Athens. It would be less predominantly classical and archæological, and its students would be found in the galleries, libraries, and churches, as well as in the museums, on the Palatine, and in the Forum. A School at Rome would also be a natural centre from which work could be directed and organised at Naples, Florence, Venice and elsewhere in Italy.

It is not therefore only to those who are interested in classical history or archæology that the proposed School should be of service, but equally to students of Christian Antiquities, of Mediæval History, of Palæography, and of Italian Art.

It is clearly desirable that the School at Athens and the School at Rome should be closely and intimately connected, and should, if possible, be managed by a single Committee; and that the Universities, the British Museum, and other learned bodies should be given as direct an interest as possible in both. It would, moreover, be of great importance to connect the Record Office, and its representatives in Italy, with the School at Rome.

The immediate control of the School would necessarily be vested in a director, who should be a man of wide sympathies and of sufficient attainments and standing to hold his own with the heads of the foreign schools.

It would be essential to secure a house or flat, where at least a library and reading-room could be provided, and probably apartments for the director.

It would also be desirable, as in the case of the School at Athens, to offer at least two Studentships every year to be held at the School.

Taking all these needs into consideration, it is estimated that the smallest sum which would be required to establish and to maintain the School in any degree of efficiency would be for initial outlay £3,000, and for income £1,000 a year.

It is proposed to issue, in the spring of next year, an appeal for the Schools of Rome and Athens jointly; and all persons interested in promoting the study of art, archæology, and history, mediæval as well as classical, are earnestly invited to co-operate in making that appeal effective. In the meantime, subscriptions and donations in aid of either School, and promises of support, will be gratefully received and acknowledged by the Hon. Treasurer of the British School at Athens, Walter Leaf, Esq., 6, Sussex Place, Regent's Park, N.W.

Further information with reference to the proposed Roman School can be obtained from Professor H. F. Pelham, Trinity College, Oxford; Professor J. S. Reid, Caius College, Cambridge; or William Loring, Esq., 2, Hare Court, Temple, E.C.

The late Stephen William Williams [*F.*].

The death took place at Sandown, Isle of Wight, on Monday morning, the 11th instant, of Col. Stephen W. Williams [*F.*], F.S.A., High Sheriff of Radnorshire, after a long and painful illness.

The deceased was the eldest son of the late Mr. Stephen Williams, of Mellington Hall Farm, Shropshire. He was born 7th June 1837, and married Maria, youngest daughter of the late Captain Horatio James, R.N., who survives him. Mr. Williams was articled at Silverdale, Staffordshire, and came to Rhayader, commencing business at Penralley. At the Easter Quarter Sessions for the County of Radnor, on 7th April 1864, he was appointed County Surveyor, which position he held until March last, a period of thirty-five years.

In 1878 Mr. Williams was the principal mover in starting the Rhayader Company of the Herefordshire Rifle Volunteers, and became the first Captain. Subsequently he attained the rank of Major, and finally rose to the command of the battalion, but owing to failing health he retired a few months ago. He took a great interest in Volunteering, and was quite an authority on tactics.

Col. Williams was deeply interested in archæological and antiquarian questions, and had written many Papers on these subjects. His greatest effort was *The Cistercian Abbey of Strata Florida*, a standard work, published in 1889, giving its history and an account of the recent excavations made on its site. He took an active interest in the excavations made at Talley Abbey, Carmarthenshire, and in the investigations respecting the old abbey at Cwmhir, Radnorshire. He was a member of the Cymmrodorion Society, and took a deep interest in matters affecting the national customs of Wales.

Col. Williams was appointed High Sheriff of the county of Radnor in March last, and his last public appearance was at Presteign on 19th July, when he entertained Mr. Justice Bruce at the Summer Assizes. A short time previous to this he attended a coroner's inquest at the Court House, Rhayader, as the legal custodian of the treasure-trove found in the neighbourhood, and as a witness displayed an intimate acquaintance with the antiquity and value of all the articles discovered, which consisted of a massive gold ring set with onyx, an amulet, and a necklet, all of a Roman type and most delicate workmanship. The articles are now deposited in the British Museum, and the finder received for them about £50.

Col. Williams was an eminent authority on Church Architecture, having been engaged in the restoration or erection of numerous churches, not only in Radnorshire, but throughout Mid-Wales. One of his best works was a new church erected at Newbridge-on-Wye for the late Mr. George Venables, Q.C.

MINUTES. IV.

At the Fourth General Meeting (Ordinary) of the Session 1899–1900, held on Monday, 18th December 1899, at 8 p.m., the President, Mr. William Emerson, in the Chair, with 17 Fellows (including 10 members of the Council), 13 Associates, and several visitors, the Minutes of the Meeting held 4th December 1899 [p. 56] were taken as read and signed as correct.

The decease was announced of Stephen William Williams, F.S.A., of Rhayader, *Fellow*.

The following candidates for membership, found by the Council to be eligible and qualified according to the Charter and By-laws, and admitted by them to candidature, were recommended for election—namely: As Fellows, Herbert Baker [*A.* 1890, *Ashpitel Prizeman* 1889], Cape Town; Frank Gatley Briggs, Liverpool; John Murray [*A.* 1892]; Harry Vernon Wolstenholme, Blackburn.

A Paper by Mr. Thomas Blashill [*F.*], entitled The Architect in Relation to Fire Prevention, having been read by the author, and a communication from Mr. Arthur Cates [*F.*] on the same subject having been read by the Secretary, a discussion ensued, and a vote of thanks was passed to Mr. Blashill by acclamation.

The proceedings then closed, and the Meeting separated at 10.10 P.M.